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ABSTRACT

This module on diuretics is intended for use in inservice or continuing education programs for persons who administer medications in long-term care facilities. Instructor information, including teaching suggestions, and a listing of recommended audiovisual materials and their sources appear first. The module goal and objectives are then provided. A brief discussion follows of the structure and function of the kidney, commonly used drugs from the diuretic group and their actions and implications in the treatment of congestive heart failure, and considerations and suggestions for resident care. This discussion is intended for use as a lecture or participant reading. Other contents include a vocabulary list, a worksheet, a chart of commonly used diuretics, and a diagram of the urinary system, all of which are suitable for reproduction for use as handouts. (YLB)

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DIURETRICS

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Diuretics

Instructor Information

This module was developed to be used as a teaching aid for inservice programs or continuing education classes in a long term care facility. This module discusses commonly used drugs from the Diuretic group. Included in this module is a brief lecture outline on the structure and function of the kidney. The QMA worksheet and a chart of commonly used diuretics, including their side effects and interactions, can be duplicated for the participants. These materials can be distributed for use as a teaching aid.

Audio Visual Materials

Trainex filmstrips are available on loan at no charge through Vocational Education Services, Indiana University.

Diuretics AV070039
Physiology of the Kidney AV070042
Hypertension: Your Patient and You AV070045

Diuretics

Goal

The goal of this module is to familiarize the QMA with specific drugs from the Diuretics groups, their actions and implications in the treatment of Congestive Heart Failure (C.H.F.). To diminish or lessen the work load of the heart, and to rid the body of excess fluid, diuretics are often ordered for the patient with C.H.F. The patient with congestive heart failure is often edematous because the blood is unable to eliminate its waste products through the kidney and the heart is not pumping strong enough to push the blood through the vessels. The QMA is often responsible for administering diuretic medications to the patient.

Objectives

After lecture, review of the function of the blood and urinary elimination, class discussion and quiz, the QMA will:

- Describe two functions of diuretic medications.
- Label the structure and define the function of the kidney.
- List 5 drugs from the diuretic group.
- Name 5 adverse reactions that may occur with the use of diuretics.
- List 3 indications for the administration of diuretics.
- Increase word power by defining 5 terms.
- Complete the quiz and class activity with instructor.

General Discussion

Diuretic drugs are used in the treatment of congestive heart failure, hypertension, or increased blood pressure, and complications of heart disease such as acute pulmonary edema. Diuretics act upon the body by increasing the flow of urine. They also enable to body to rid itself of *sodium* (salt), as sodium will cause the body to retain fluids. Diuretics are absorbed from the gastrointestinal tract and excreted largely in the urine.

Structure and Function of the Kidney

Structure—The kidneys are 2 bean shaped organs consisting of a series of tubules, ducts and blood vessels. The basic unit of kidney structure and function is the *nephron*. Each kidney has over a million nephrons.

Blood reaches the kidney by means of the renal artery and passes through the tubules where it is subject to filtration and reabsorption. The outside of the kidney is smooth, but the inside contains 8 to 10 lobes divided by branching arteries.

Function—About 1200 ml. of blood flows through the kidney of a resting young adult per minute. As the blood flows through the kidney, waste materials are filtered out and left behind. These unwanted waste materials will be excreted in a solution called urine. The function of the kidney is to filter out certain substances from the blood. As the blood passes through the tubules, it is filtered into many separate substances or chemicals called electrolytes, water and glucose (sugar). Eighty-seven percent of the water is reabsorbed into the body to prevent dehydration. All glucose is reabsorbed to provide energy and food to the body cells, as are most electrolytes. Electrolytes are substances in the blood such as calcium, sodium, potassium, and bicarbonate that help the body to maintain chemical balance.

The waste products, urea, creatinine and uric acid are not reabsorbed and pass from the body in the urine. For every 1200 ml. of blood entering the kidney per minute, 125 ml. are filtered and 124 ml. are reabsorbed. Thus, urine is formed at the rate of 1 ml. per minute.

Only 2 quarts per day are excreted as urine. Urine is collected in the hilum of the kidney and transported to the bladder by means of the ureter which connects the kidney to the urinary bladder. After urine is collected in the bladder, it passes out of the body through the urethra.

Indications for Administration of Diuretic Drugs

Congestive Heart Failure—occurs when the heart is unable to circulate blood to tissues to effectively supply tissues with oxygen and remove waste products. Symptoms of C.H.F. are:

- lung congestion
- cough
- weight gain
- nocturia
- insomnia
- anorexia
- nausea
- edema

Hypertension—occurs when there is a persistently high arterial pressure, with a pressure of 140/90 regarded as borderline. As blood pressure increases, the heart must work harder. Symptoms of hypertension are:

- headache
- giddiness
- forgetfulness
- insomnia
- irritability
- epistaxis
- blurred vision
- shortness of breath

Acute Pulmonary Edema—is a life threatening event characterized by a sudden increase of fluid into the lungs. Acute pulmonary edema may be a complication of congestive heart failure. Symptoms of acute pulmonary edema are:

- severe respiratory distress
- coughing
- noisy breathing
- cyanosis
- anxiety

Action

Diuretics improve the excretion of sodium and water through the kidneys. Diuretics do not stimulate diseased kidneys. They are used primarily to rid the body of excess fluid, thereby lessening the strain on the heart and lowering of blood pressure. Diuretics are classified according to how they act upon the kidney. Essentially, diuretics act in two ways:

- By blocking the reabsorption of sodium and chloride
- By increasing the excretion of sodium and chloride

Drug Therapy

Classification of Diuretics

Thiazides

- Most commonly used
- Promote kidney excretion of sodium, chloride, and potassium
- Significantly increase potassium excretion
- Most dangerous side effect is potassium depletion or hypokalemia
- Symptoms of hypokalemia include muscle weakness
- May raise blood sugar levels

Potassium sparing diuretics

- Used with thiazides for edema
- Most serious adverse effect is hyperkalemia (increased potassium)
- If untreated (hyperkalemia) may lead to renal shutdown (kidney failure) and heart block

Potent or loop diuretics

- Promote excretion of sodium, water, and large amounts of potassium
- Diuresis occurs within one hour of oral administration
- Can cause severe imbalance in body's chemistry of potassium, sodium, chloride, calcium, and magnesium
- Ototoxicity or deafness may occur with oral or IV administration
- Other adverse reactions include rash, lethargy, weakness, dizziness, abdominal discomfort, mental confusion, and circulatory collapse

Role of the Person Administering Diuretics to the Resident in a Long-Term Care Facility

Patient Education

- Inform resident that large and frequent amounts of urine is a normal reaction to this medication
- Inform resident to void in bedpan, or urinal if on intake and output
- Encourage resident to eat foods high in potassium such as oranges and bananas
- Encourage resident to limit salt intake

Observation for response to treatment

- Record changes in edema
- Observe resident for overhydration (edema) or dehydration
- Report and record adverse effects of medication—nausea, vomiting, muscle weakness, cramps
- Protect edematous skin of extremities by elevation, padding, or sheepskin
- Monitor vital signs periodically
- Lowered B/P may cause orthostatic hypotension; assist resident with ambulation; teach resident to change position slowly

Drug Interactions

Thiazide diuretics may interact with

- Antihypertensive drugs to increase the effect of antihypertensive agents
- Corticosteroids to cause low potassium levels
- Norepinephrine to decrease arterial responsiveness of norepinephrine
- Antidiabetic agents requiring an adjustment in dosage of antidiabetic drug
- Lithium, causing lithium toxicity
- Cardiac glycosides such as crystodigin to produce digitalis toxocity

Potassium sparing diuretics may interact with

- Other diuretics or antihypertensive agents to cause an additive effect
- Norepinephrine to reduce the vascular response
- Potassium, causing hyperkalemia

Potent or loop diuretics may interact with

- Antihypertensive agents to increase effect of antihypertensive medication
- Digitalis to produce ditigalis toxicity
- Lithium, to produce lithium toxicity

- Aminoglycoside antibiotics or cephalosporins to cause ototoxicity (deafness) and nephrotoxicity (kidney damage)
- Alcohol, barbiturates or narcotics to cause orthostatic hypotension
- Corticosteroids, to produce lowered potassium levels
- Salicylates, to cause aspirin toxicity at lower doses

Summary

Most diuretics produce an imbalance in the chemical composition of the body. Potassium levels are especially important, as changes in this electrolyte may cause muscle weakness and heart irregularities. Physicians may prescribe potassium in the form of an oral medication called K-Lyte or Kaon. These supplements may cause gastrointestinal irritation.

Diuretics are useful in the management of edema, hypertension, congestive heart failure, and acute pulmonary edema as long as the kidneys are capable of functioning.

Care of the Resident Receiving Diuretics

Considerations	Suggestions
Observe for edema.	Daily weight can be used to determine edema. Intake and output indicates fluid gain or loss. Observe hands, feet and legs. Watch for noisy breathing.
Help resident to reduce sodium intake.	Some tooth cleansers contain lots of sodium—rinse mouth well after using. Discourage use of salt in food. Remember that some antacids contain sodium.
Reduce discomfort of edema.	Elevate feet and legs. Protect edematous feet and legs by padding or sheepskin.
Prevent respiratory distress.	Keep head elevated.
Watch for adverse drug reactions.	Report and record nausea, vomiting, diarrhea, constipation, dizziness, headache, weakness, muscle cramps.
Help to maintain adequate potassium in the body.	Report complaints of muscle cramps and weakness (signs of low potassium level). Encourage resident to eat potassium rich foods such as oranges and bananas.
Promote adequate rest for the resident.	Do not give diuretics before bedtime.

Vocabulary

Increase your word power by learning the following terms:

Edema—swelling
Pitting edema—"pits" are produced when a finger is pressed on a swollen area
Electrolyte—a substance in body fluids such as calcium, sodium, potassium, bicarbonate, etc., which helps the body to maintain its chemical balance
Nocturia—excessive urination at night
Anorexia—loss of appetite
Epistaxis—nose bleed
Cyanosis—blue color of the lips, skin and nailbeds
Pulmonary—referring to the lungs
Hypokalemia—low potassium level of the blood

Worksheet

Topic—Diuretics

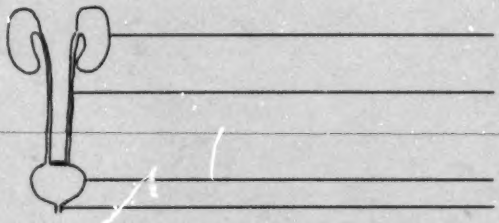
Objectives:

1. Describe two functions of the diuretic medications.

   a.

   b.

2. Label the structures and briefly define the function of the kidney.



Function:

3. List 5 drugs from the diuretic group.

   1. _____ 2. _____ 3. _____ 4. _____ 5. _____

4. Name 5 adverse reactions that may occur with the use of diuretics.

   1. _____ 2. _____ 3. _____ 4. _____ 5. _____

5. List 3 indications for the administration of diuretics.

   1. _____ 2. _____ 3. _____

6. Define by matching column A with column B

A		B
1. diuretic	____	Smallest functional unit of the kidney.
2. hypertension	____	Electrolyte
3. edema	____	Increase B/P: Causes heart to work harder.
4. nephron	____	Medications which increase the flow of urine.
5. sodium	____	Excess fluid in the tissues

Quiz—Complete the sentence to make it a true statement by filling in the blank.

1. One way of determining if edema is being controlled is to _____ the patient daily.

2. Adverse reactions to the diuretic drug group include _____, _____, and _____.

3. Three indications for the administration of duiretics are _____, _____, and _____.

4. Persons who have CHF should restrict their intake of _____.

5. Two products which may contain a large amount of sodium are _____ and .

6. Diuretics act upon the body by _____ the reabsorption of sodium and chloride.

7. Diuretics act upon the body by _____ the excretion of sodium and chloride.

8. A life threatening event that is characterized by a sudden increase of fluid in the lungs is called _____.

9. Too much fluid in the tissues is called _____.

10. Extremites of the patient who has edema should be _____.

.....

Class activity: Place letter from column A to match correct response in column B.

	A	B
a.	Lasix with chloral hydrate	____ inhibits diuretic response
b.	renal disease	____ possible damage to 8th nerve
c.	thiazides	____ may increase blood sugar
d.	Indocin	____ sweating
e.	Lasix with Garamycin	____ causes accumulative effect

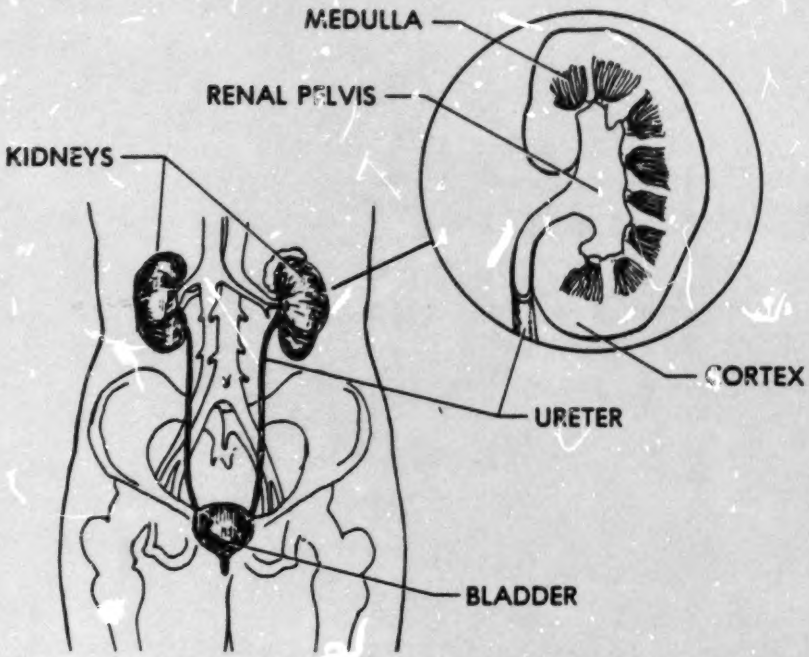
Commonly Used Diuretics

Action: ***Diuretics increase excretion of water from the body by:***

- ***Blocking reabsorption of sodium and chloride or***
- ***Increasing excretion of sodium and chloride***

Drug	Side Effects	Interacts With	To Produce	Remember
Thiazides Diuril Hydro-Diuril Enduron Diazide Aldactazide	Dizziness Weakness Blurred vision Anorexia Nausea/vomiting Skin rash Potassium loss	**Cholestyramine** Questran **Colestipol** Colestid	Decreased absorption of thiazides	Give diuretics in a.m. to prevent patient from getting up at night. Elderly patients are especially susceptible to excessive diuresis. Some diuretics increase the severity of diabetes or gout. Thiazides, furosemide, and metolazone cause potassium loss.
		Diazoxide Proglem Proglycem	Increased antihypertensive effects, may raise blood sugar levels.	
Potassium sparing spironolactone Aldactone	Drowsiness Confusion Dry mouth Rash Headache	**Aspirin**	Loss of body salt	
		Potassium drugs	Increased levels of potassium	
Potent or loop furosemide Lasix	Weakness Fatigue Hearing impairment Nausea/vomiting Diarrhea Skin rash Muscle cramps	**Digitalis drugs**	Increased digitalis side effects	
		Chloral hydrate	Flushing of skin, sweating	
		Garamycin	Poss. damage to optic nerve	
		Indocin	Inhibited diuretic response	
Thiazide and related diuretics **Metolazone** Zaroxolyn	Dizziness Chest pain Blurred vision Nausea/vomiting Diarrhea Rash Muscle cramps	**Cholestyramine** Questran **Colestipol** Colestid	Decreased absorption of thiazides	
		Diazoxide Proglem Proglycem	Increased antihypertensive effects, may raise blood sugar	

URINARY SYSTEM



FUNCTION

PRODUCE URINE

MAINTAIN HOMEOSTASIS

REMOVE WASTE FROM BLOOD STREAM